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Kohli

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(54) **SYSTEM FOR PERFORMING CROSS CARD AUTHENTICATION USING WALLET TRANSACTION AUTHENTICATION HISTORY**

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(51) **Int. Cl.**

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G06Q 30/04	(2012.01)
G06Q 10/00	(2012.01)
G06Q 20/40	(2012.01)
G06Q 20/12	(2012.01)
G06Q 20/22	(2012.01)
G06Q 20/38	(2012.01)

(52) **U.S. Cl.**
CPC ***G06Q 20/3674*** (2013.01); ***G06Q 10/00*** (2013.01); ***G06Q 20/12*** (2013.01); ***G06Q 20/227*** (2013.01); ***G06Q 20/36*** (2013.01); ***G06Q 20/382*** (2013.01); ***G06Q 20/4016*** (2013.01); ***G06Q 20/40145*** (2013.01); ***G06Q 30/04*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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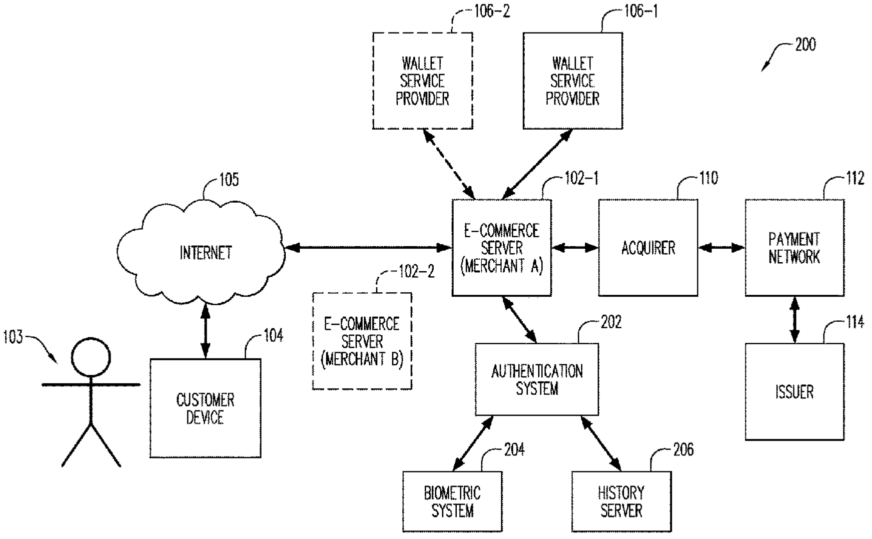
(57) **ABSTRACT**

A method includes performing a first transaction using a first payment account. The first transaction includes a successful authentication of a holder of the first payment account. A record is stored of the first transaction. The record indicates that the successful authentication occurred. A request is received for a second transaction using a second payment account. The indication of the successful authentication is detected in the stored record of the first transaction. The second transaction is completed without requiring authentication of the account holder.

7 Claims, 7 Drawing Sheets



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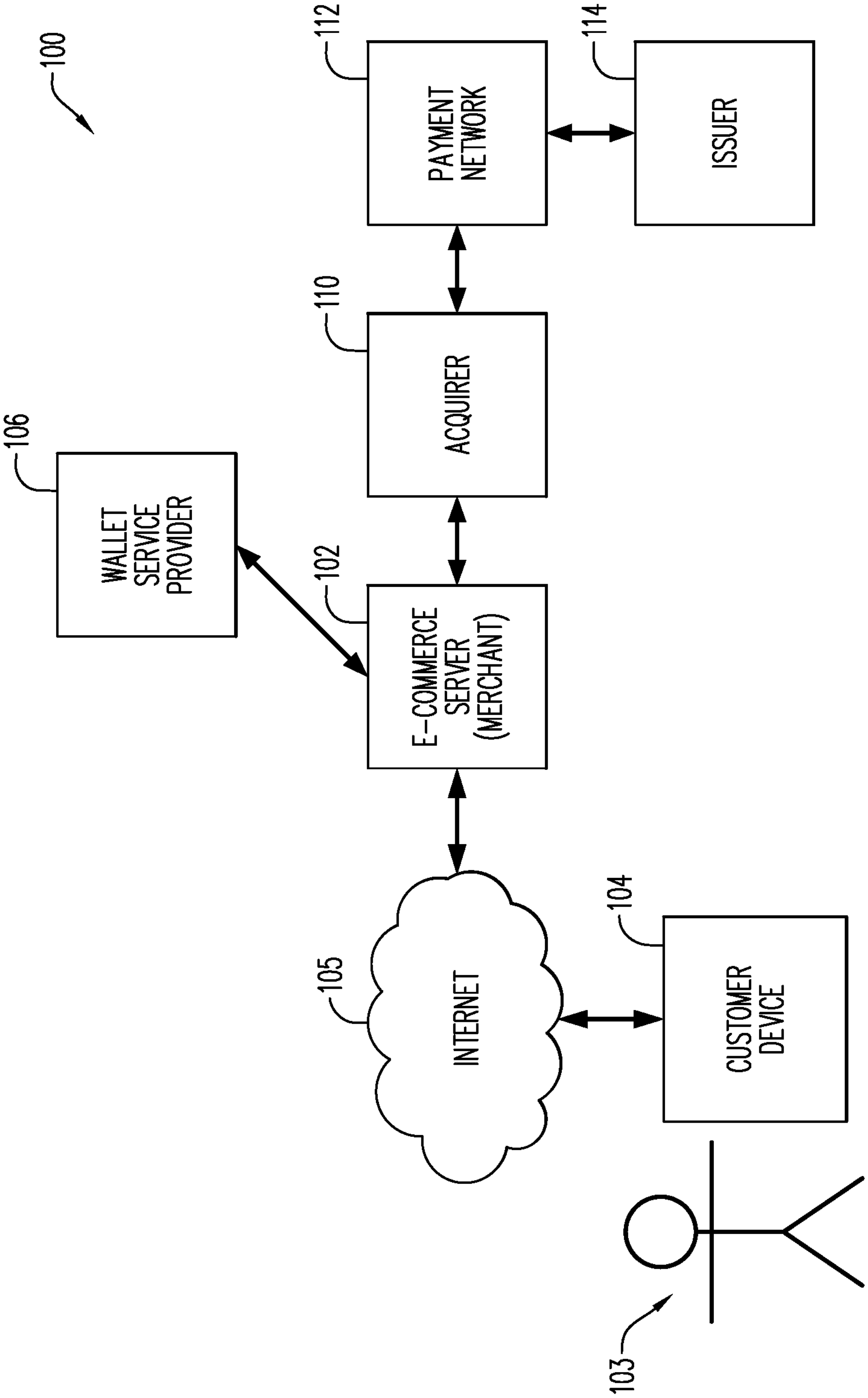

FIG. 1
(PRIOR ART)

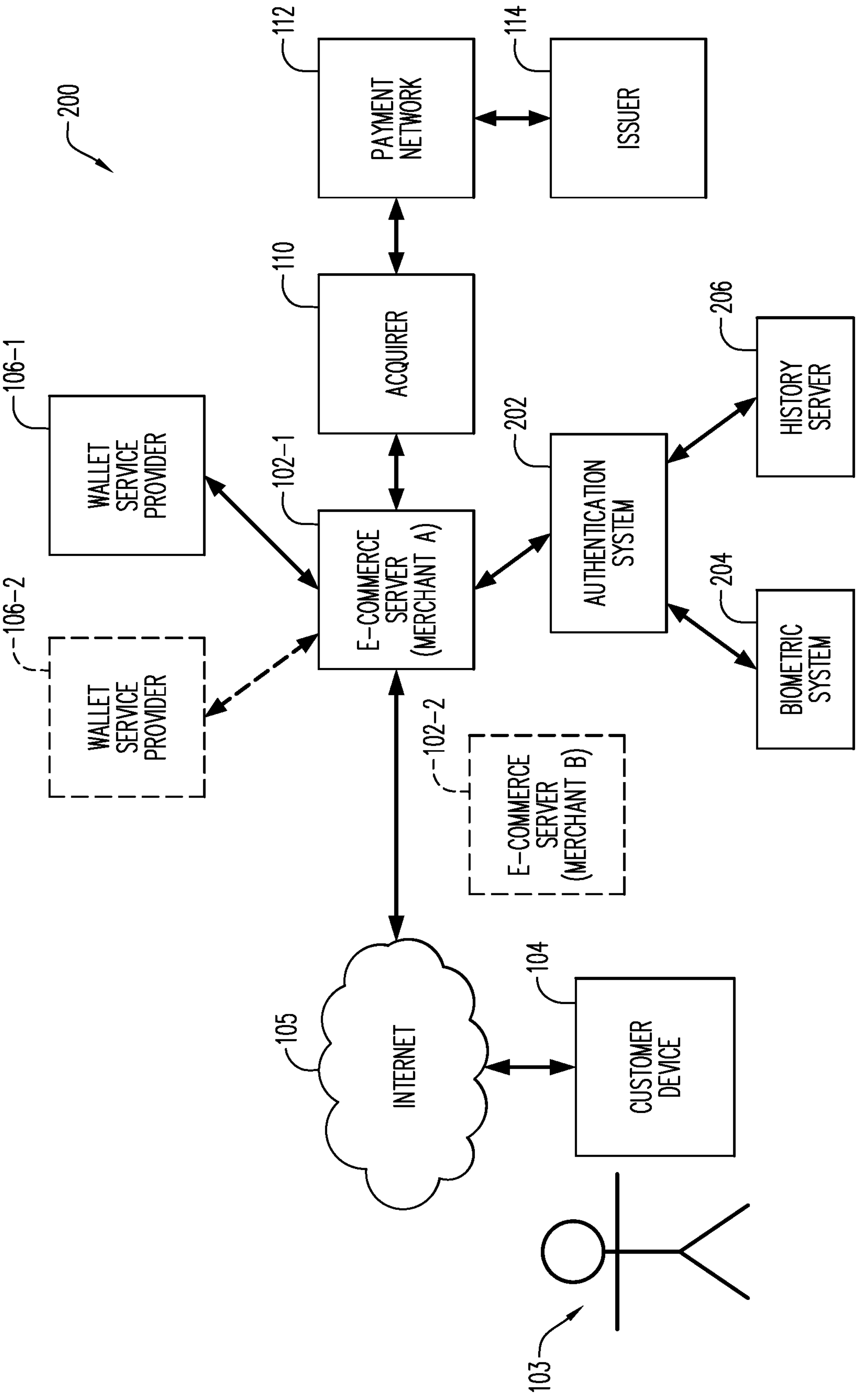
200
112
PAYMENT NETWORK
114
ISSUER
110
ACQUIRER
106-1
WALLET SERVICE PROVIDER
106-2
WALLET SERVICE PROVIDER
102-1
E-COMMERCE SERVER (MERCHANT A)
102-2
E-COMMERCE SERVER (MERCHANT B)
202
AUTHENTICATION SYSTEM
206
HISTORY SERVER
204
BIOMETRIC SYSTEM
105
INTERNET
104
CUSTOMER DEVICE
103

FIG. 2

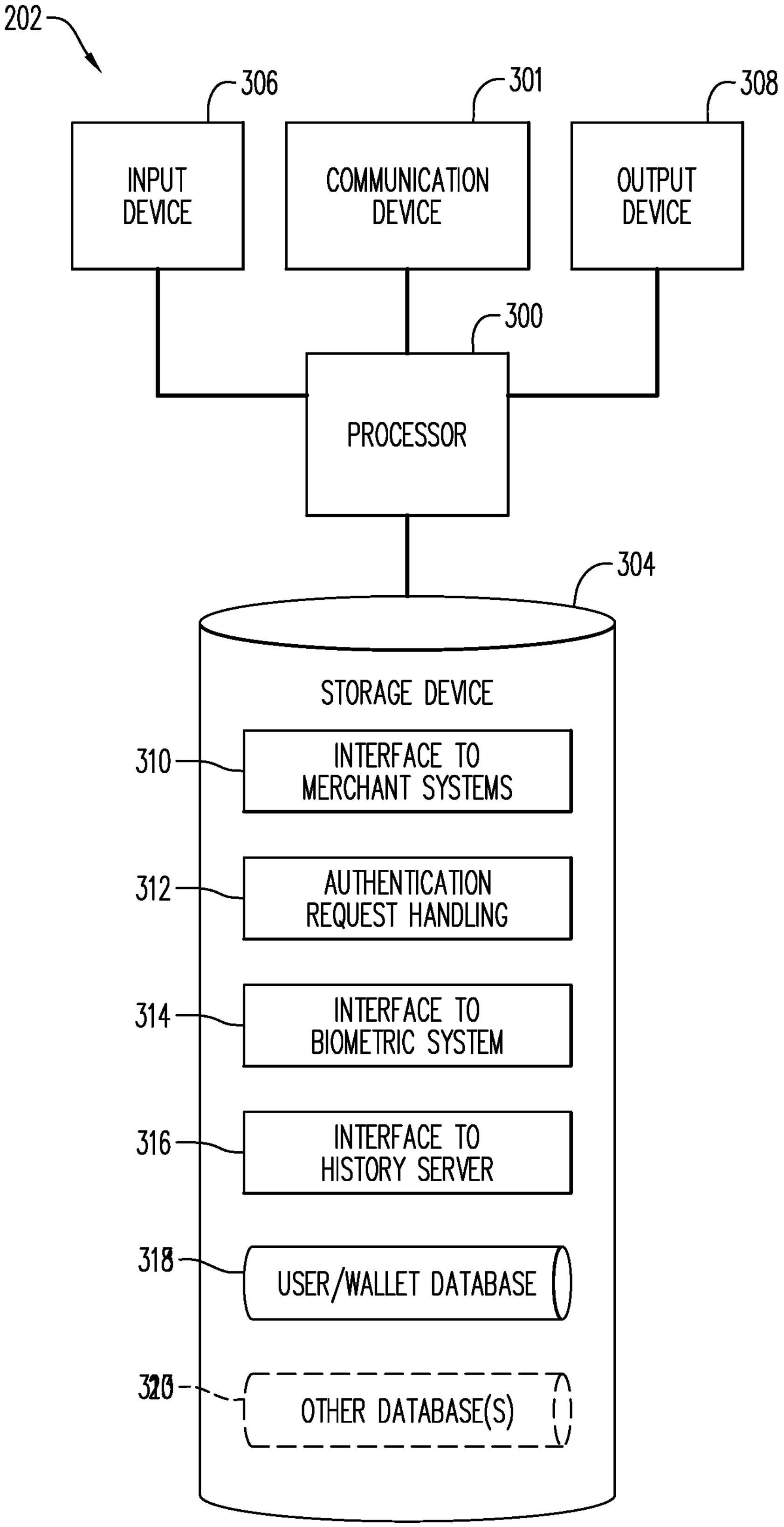
202
306
INPUT DEVICE
301
COMMUNICATION DEVICE
308
OUTPUT DEVICE
300
PROCESSOR
304
STORAGE DEVICE
310
INTERFACE TO MERCHANT SYSTEMS
312
AUTHENTICATION REQUEST HANDLING
314
INTERFACE TO BIOMETRIC SYSTEM
316
INTERFACE TO HISTORY SERVER
318
USER/WALLET DATABASE
320
OTHER DATABASE(S)

FIG. 3

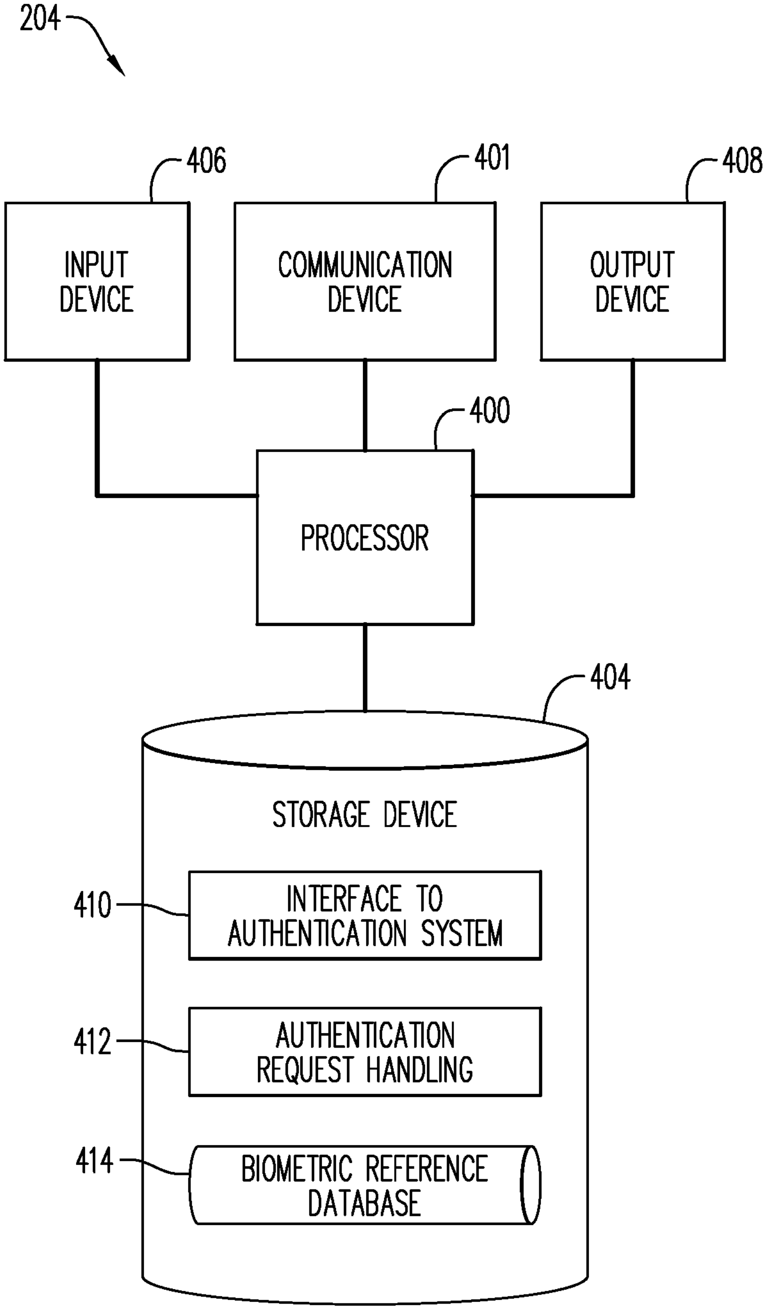
204
406
401
408
INPUT DEVICE
COMMUNICATION DEVICE
OUTPUT DEVICE
400
PROCESSOR
404
STORAGE DEVICE
410
INTERFACE TO AUTHENTICATION SYSTEM
412
AUTHENTICATION REQUEST HANDLING
414
BIOMETRIC REFERENCE DATABASE

FIG. 4

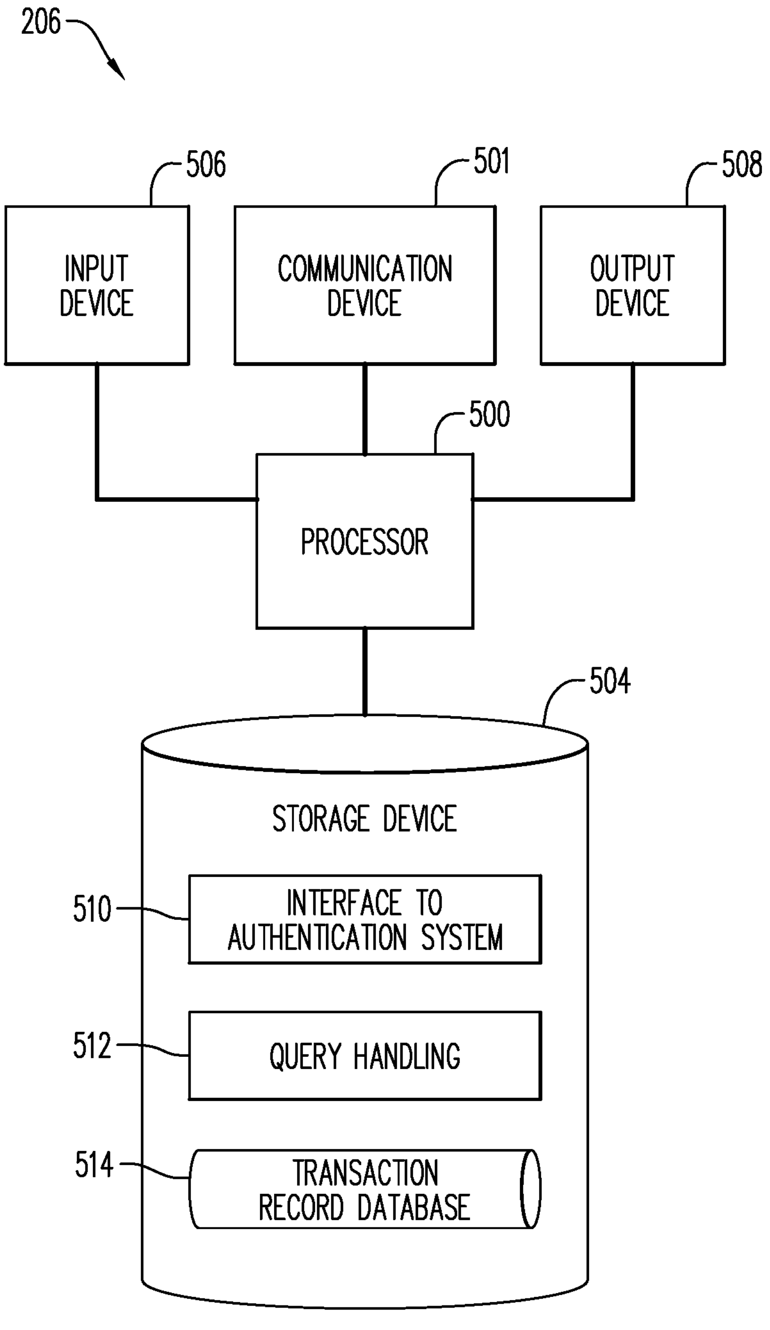
206
506
INPUT DEVICE
501
COMMUNICATION DEVICE
508
OUTPUT DEVICE
500
PROCESSOR
504
STORAGE DEVICE
510
INTERFACE TO AUTHENTICATION SYSTEM
512
QUERY HANDLING
514
TRANSACTION RECORD DATABASE

FIG. 5

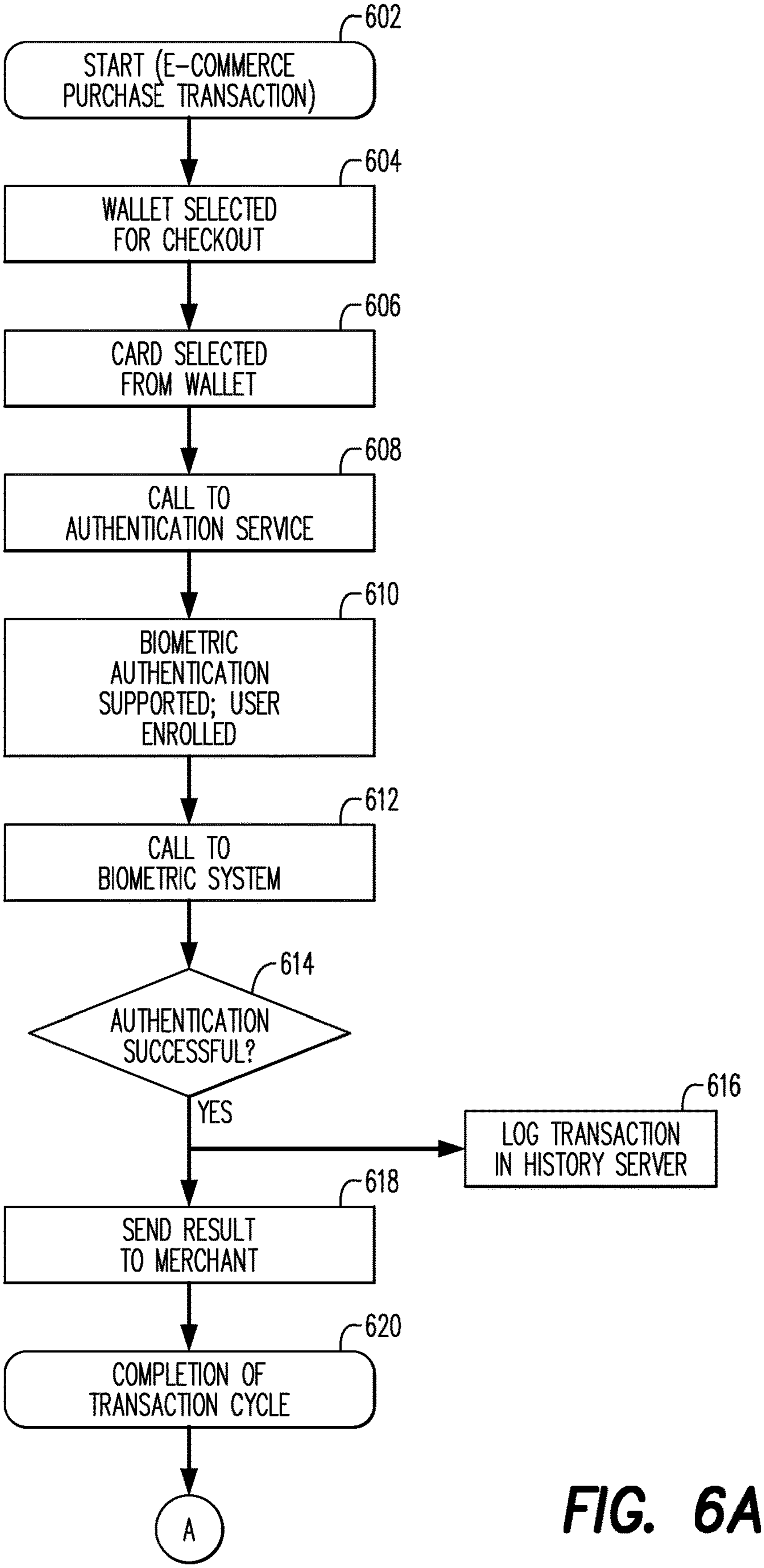
602
START (E-COMMERCE PURCHASE TRANSACTION)
604
WALLET SELECTED FOR CHECKOUT
606
CARD SELECTED FROM WALLET
608
CALL TO AUTHENTICATION SERVICE
610
BIOMETRIC AUTHENTICATION SUPPORTED; USER ENROLLED
612
CALL TO BIOMETRIC SYSTEM
614
AUTHENTICATION SUCCESSFUL?
YES
616
LOG TRANSACTION IN HISTORY SERVER
618
SEND RESULT TO MERCHANT
620
COMPLETION OF TRANSACTION CYCLE
A

FIG. 6A

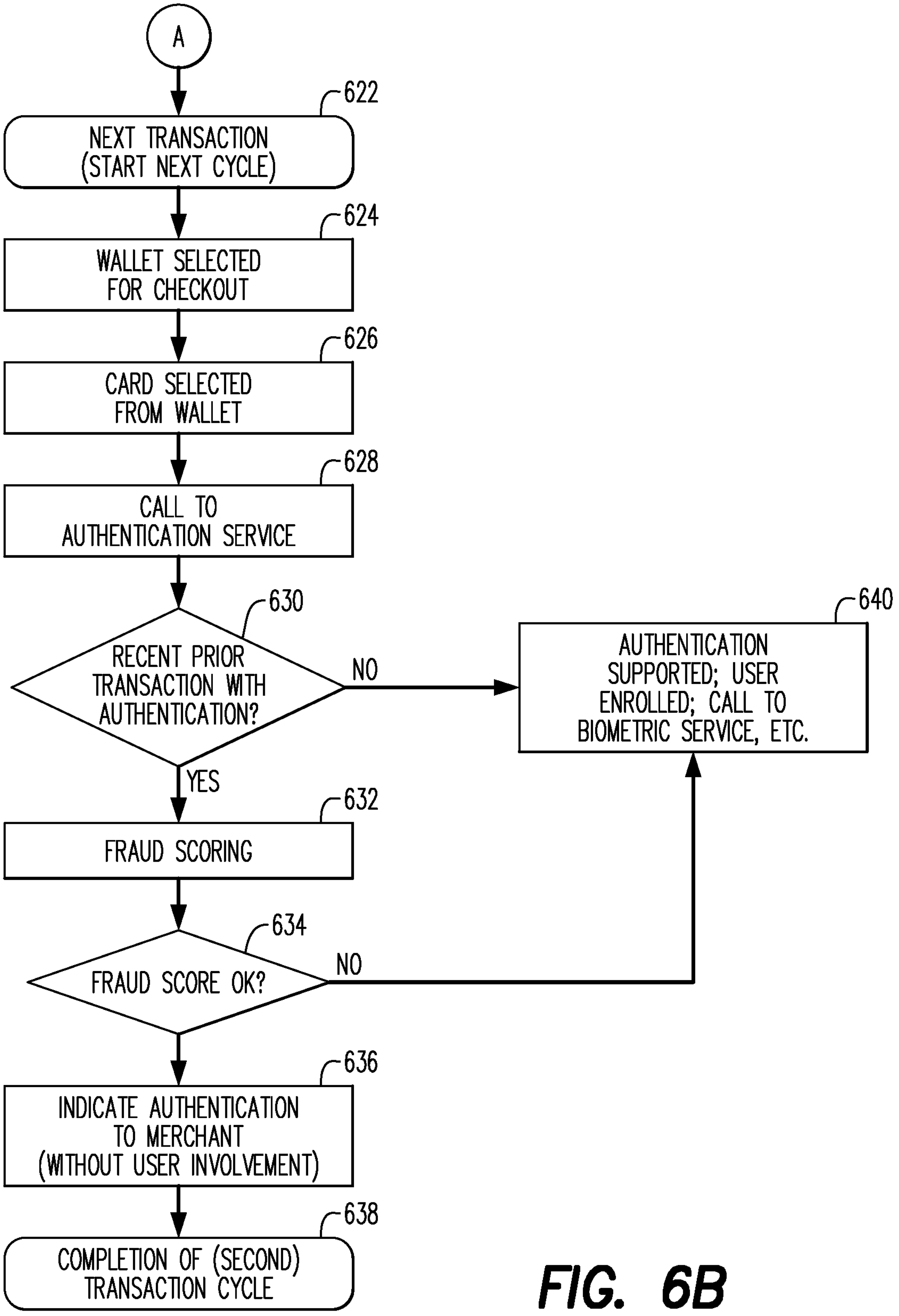
A
622
NEXT TRANSACTION (START NEXT CYCLE)
624
WALLET SELECTED FOR CHECKOUT
626
CARD SELECTED FROM WALLET
628
CALL TO AUTHENTICATION SERVICE
630
RECENT PRIOR TRANSACTION WITH AUTHENTICATION?
NO
640
AUTHENTICATION SUPPORTED; USER ENROLLED; CALL TO BIOMETRIC SERVICE, ETC.
YES
632
FRAUD SCORING
634
FRAUD SCORE OK?
NO
636
INDICATE AUTHENTICATION TO MERCHANT (WITHOUT USER INVOLVEMENT)
638
COMPLETION OF (SECOND) TRANSACTION CYCLE

FIG. 6B

SYSTEM FOR PERFORMING CROSS CARD AUTHENTICATION USING WALLET TRANSACTION AUTHENTICATION HISTORY

BACKGROUND

Payment accounts are in widespread use for both in-store and online purchase transactions. FIG. **1** is a block diagram of a previously proposed version of a payment system (generally indicated by reference numeral **100**) as it may operate in connection with an online purchase transaction.

The system **100** includes an e-commerce server computer **102** that may be operated by or on behalf of an online merchant to permit online shopping transactions. For this purpose, as is well known, the e-commerce server computer **102** may host a shopping website, sometimes referred to as an "online store". A customer **103** who operates a customer device **104** may access the shopping website by communicating over the Internet **105** with the e-commerce server computer **102**. As is very well-known to those who are skilled in the art, the customer device **104** may be, for example, a personal computer or notebook computer that runs a browser program, a tablet computer or smartphone that runs a mobile browser and/or a suitable app, etc. As is very familiar to those who shop online, after the customer has selected one or more items of merchandise for purchase from the online store, he/she may elect to enter a checkout phase of the online purchase transaction. In some situations, during the checkout phase, the customer enters payment information, such as a payment account number, expiration date, security code, etc. into an online form. However, according to some proposals, the customer may be presented with an option to select use of the customer's digital wallet, which has been stored in a wallet service provider's computer **106**. The digital wallet may contain data relating to several of the customer's payment accounts, and selecting the digital wallet option may result in the customer being presented with the opportunity to select one of those payment accounts for use in the current online purchase transaction. Upon the customer indicating selection of one of the accounts in the digital wallet, the wallet service provider **106** may make the corresponding data (again, payment account number, expiration date, security code, etc.) for the selected account available to the merchant's e-commerce server **102**.

In connection with the online purchase transaction, the e-commerce server computer **102** may transmit a transaction authorization request message (sometimes simply referred to as an "authorization request") to the merchant's acquirer financial institution ("acquirer" or "transaction acquirer"), indicated by reference numeral **110**. Assuming that the digital wallet scenario described above had occurred, the authorization request may include the payment data provided from the wallet service provider **106** to the e-commerce server **102**.

The acquirer **110** may route the authorization request via a payment network **112** to a server computer **114** operated by the issuer of the payment account that corresponds to the payment data included in the authorization request. Also, the authorization response generated by the issuer server computer **114** may be routed back to the acquirer **110** via the payment network **112**. The acquirer **110** may confirm to the merchant (i.e., to the e-commerce server computer **102**) that the transaction has been approved.

The payment network **112** may be, for example, the well-known Banknet® system operated by MasterCard International Incorporated, which is the assignee hereof.

The components of the system **100** as depicted in FIG. **1** are only those that are needed for processing a single transaction. Those who are skilled in the art will recognize that in the real world, online shopping and payment systems may process many purchase transactions (including simultaneous transactions) and may include a considerable number of payment account issuers and their computers, a considerable number of acquirers and their computers, and numerous merchants and their e-commerce servers. The system may also include a very large number of customers/online shoppers, who hold payment accounts that they use for their online shopping activities. In some environments there may also be a number of wallet service providers. It is also well known that elements of the system **100** (e.g., acquirers, the payment network, payment account issuers) may play similar roles in connection with in-store purchase transactions and in other types of transactions.

In some online transactions, a user authentication procedure may be included to help guard against fraudulent transactions. For example, some user authentication procedures may include biometric processing. That is, the customer/user may be challenged to provide a biometric characteristic (e.g., a fingerprint/thumbprint) to the customer's device. Data representative of the submitted biometric characteristic may be uploaded to a remote authentication service (not shown in FIG. **1**). The authentication service may verify the uploaded biometric data against previously stored biometric reference data for the user to complete the user authentication. In other types of user authentication procedures, the user may be prompted to enter a PIN (personal identification number) or other data that is intended to be maintained as a secret by the user.

There is often a trade-off between requirements for security measures, such as user authentication, versus convenience for the customer. Moreover, customer convenience can be a critical factor in e-commerce businesses, since in many cases a customer who actually intends to purchase and has selected merchandise may abandon the transaction and navigate away from the online store website if the checkout phase entails more steps and/or more delays than the customer is willing to tolerate. Online merchants are eager to avoid abandonment of transactions, as just described, while at the same time the merchants and account issuers also wish to take prudent measures to combat fraud.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of some embodiments of the present disclosure, and the manner in which the same are accomplished, will become more readily apparent upon consideration of the following detailed description of the disclosure taken in conjunction with the accompanying drawings, which illustrate preferred and exemplary embodiments and which are not necessarily drawn to scale, wherein:

FIG. **1** is a block diagram that illustrates a conventional system that handles online purchase transactions.

FIG. **2** is a block diagram of a payment system according to some embodiments.

FIGS. **3**, **4** and **5** are block diagram representations of computers that may serve as components of the system shown in FIG. **2**.

FIGS. **6**A and **6**B together form a flow chart that illustrates aspects of the present disclosure.

DETAILED DESCRIPTION

In general, and for the purpose of introducing concepts of embodiments of the present disclosure, an authentication service for online transactions may keep records of transactions in which a strong user authentication process, such as a biometric process, has been successfully performed. Based on the record(s) of successful user authentication, the authentication service may cause user authentication processes to be skipped in subsequent transactions in which, for example, the user is employing a payment account held in the same digital wallet with the account used for the transaction(s) in which strong user authentication took place. In some embodiments, the skipping of user authentication may continue for only a pre-set period of time after the initial transaction(s) in which user authentication occurred.

FIG. **2** is a block diagram of a payment system **200** provided according to some embodiments. The payment system **200** incorporates all of the elements referred to above in connection with FIG. **1**. For example, elements/entities **103**, **104**, **105**, **110**, **112** and **114** are carried over in the payment system **200** as depicted in FIG. **2** from the depiction of the payment system **100** shown in FIG. **1**. Further, an element designated by the reference numeral **102-1** (e-commerce server) in FIG. **2** corresponds to the element designated by reference numeral **102** in FIG. **1**. Also, an element designated by the reference numeral **106-1** (wallet service provider) in FIG. **2** corresponds to the element designated by reference numeral **106** in FIG. **1**.

Moreover, and as a reflection of teachings of the present disclosure—according to which, events that occur in one transaction have a bearing on steps taken or not taken in another transaction—another e-commerce server **102-2** is shown in phantom in FIG. **2**. The depiction of e-commerce server **102-2** in FIG. **2** is intended to suggest functionality of the payment system **200** such that the customer **103** may—after engaging in an online transaction with the e-commerce server **102-1**—at a subsequent point in time engage in another online transaction via the e-commerce server **102-2**. Thus while FIG. **2** for the most part depicts aspects of the payment system **200** pertinent to a single transaction, the depiction in FIG. **2** further suggests two or more transactions in sequence that may be engaged in by the customer **103** via the payment system **200**. (It is to be noted that a further and additional acquirer—not shown—may be involved in a later transaction as the transaction acquirer for the merchant that operates the e-commerce server **102-2**; also, in a case where the customer **103** uses a different payment account in the later transaction, a further and additional account issuer—not shown—may be involved as the issuer of the payment account used in the later transaction.)

Still further, FIG. **2** depicts in phantom an additional wallet service provider **106-2**, so as to suggest that the customer may have more than one digital wallet, with one digital wallet maintained at wallet service provider **106-1** and another digital wallet maintained at wallet service provider **106-2**.

According to aspects of the present disclosure, the payment system **200** also includes an authentication system **202**. Details of the authentication system **202** will be discussed below. To briefly summarize some of the functionality of the authentication system **202**, it manages user authentication processes in connection with online purchase transactions; also in accordance with teachings of the present disclosure, the authentication system **202** selectively omits user authentication from some transactions in situations when recent transaction history indicates that the need for/benefits from user authentication are reduced for a current transaction. In some embodiments, the authentication system **202** may be operated by the operator of the payment network **112**.

The payment system **200** may further include a biometric system **204**. The biometric system **204** may be in communication with the authentication system **202**. Under direction from the authentication system **202**, the biometric system **204** may handle biometric-based user authentication processes in connection with online purchase transactions. Further details of the biometric system **204** are described below.

Still further, the payment system **200** may include a history server computer **206**. The history server computer **206** may be in communication with the authentication system **202**. The history server computer **206** may function as a repository for transaction history data to support determinations by the authentication system **202** as to when it is advisable to omit user authentication from the flow of events in connection with a given online purchase transaction.

The biometric system **204** and the history server computer **206** may be under common operation with the authentication system **202**.

To discuss the subject matter of FIG. **2** more generally, it should be understood that in most cases, blocks labeled therein with names/descriptions of entities should also be understood to represent computer systems operated by or for such entities.

It should also be understood that, for at least some types of participants in the payment system **200**, there may be a considerable or even a very large number of participants of those types in practical embodiments of the payment system **200**. Moreover, one or more components of the payment system **200** may handle in-store purchase transactions and/or other types of transactions in addition to online purchase transactions.

In some embodiments, any two or more of the authentication system **202**, the biometric system **204**, and/or the history server computer **206** may be constituted by components of an interrelated and/or integrated computer system and/or may be housed together in a single data center.

FIG. **3** is a block diagram representation of an embodiment of the authentication system **202**.

In some embodiments, hardware aspects of the authentication system **202** may be constituted by typical server computer hardware, but may be controlled by software to cause it to function as described herein.

The authentication system **202** may include a processor **300** operatively coupled to a communication device **301**, a storage device **304**, an input device **306** and an output device **308**. The communication device **301**, the storage device **304**, the input device **306** and the output device **308** may all be in communication with the processor **300**.

The processor **300** may be constituted by one or more processors. The processor **300** may operate to execute processor-executable steps, contained in program instructions described below, so as to control the authentication system **202** to provide desired functionality.

Communication device **301** may be used to facilitate communication with, for example, other devices (such as e-commerce servers, the biometric system **204**, the history server computer **206**). For example, communication device **301** may comprise numerous communication ports (not separately shown), to allow the authentication system **202** to perform its roles in connection with numerous simultaneous online purchase transactions.

Input device **306** may comprise one or more of any type of peripheral device typically used to input data into a computer. For example, the input device **306** may include a keyboard and a mouse. Output device **308** may comprise, for example, a display and/or a printer.

Storage device **304** may comprise any appropriate information storage device, including combinations of magnetic storage devices (e.g., hard disk drives), optical storage devices such as CDs and/or DVDs, and/or semiconductor memory devices such as Random Access Memory (RAM) devices and Read Only Memory (ROM) devices, as well as so-called flash memory. Any one or more of such information storage devices may be considered to be a computer-readable storage medium or a computer usable medium or a memory.

Storage device **304** stores one or more programs for controlling processor **300**. The programs comprise program instructions (which may be referred to as computer readable program code means) that contain processor-executable process steps of the authentication system **202**, executed by the processor **300** to cause the authentication system **202** to function as described herein.

The programs may include one or more conventional operating systems (not shown) that control the processor **300** so as to manage and coordinate activities and sharing of resources in the authentication system **202**, and to serve as a host for application programs (described below) that run on the authentication system **202**.

The programs stored in the storage device **304** may also include a software interface **310** that controls the processor **300** to support communication between the authentication system **202** and merchant e-commerce servers such as the computers represented by blocks **102-1** and **102-2** in FIG. **2**.

Further, the storage device **304** may store an authentication request handling application program **312**. The authentication request handling application program **312** may control the processor **300** such that the authentication system **202** provides functionality as described herein in connection with requests for user authentication related to online purchase transactions.

Still further, the storage device **304** may store a software interface **314** that controls the processor **300** to support interactions between the authentication system **202** and the biometric system **204**. In addition, the storage device **304** may store a software interface **316** that controls the processor **300** to support access of the authentication system **202** to the history server computer **206**.

The storage device **304** may also store, and the authentication system **202** may also execute, other programs, which are not shown. For example, such programs may include a reporting application, which may respond to requests from system administrators for reports on the activities performed by the authentication system **202**. The other programs may also include, e.g., device drivers, database management programs, communications software, etc.

The storage device **304** may also store a user and wallet database **318** that is referenced by the authentication request handling application program **312** for the purpose of determining when to omit user authentication from the events involved in a given online purchase transaction. Data identifying users and/or their wallets may be registered and stored in the user and wallet database **318** in advance of subsequent uses of payment accounts stored in the digital wallets belonging to system users.

In some embodiments, the storage device **304** may also store one or more databases (reference numeral **320**) required for operation of the authentication system **202**.

FIG. **4** is a block diagram of an embodiment of the biometric system **204**.

In its hardware architecture and components, the biometric system **204** may, for example, resemble the hardware architecture and components described above in connection with FIG. **3**. However, the biometric system **204** may be programmed differently from the authentication system **202** so as to provide different functionality.

Returning again to the hardware aspects of the biometric system **204**, it may include a processor **400**, a communication device **401**, a storage device **404**, an input device **406** and an output device **408**. The communication device **401**, the storage device **404**, the input device **406** and the output device **408** may all be in communication with the processor **400**.

The above descriptions of the hardware components shown in FIG. **3** may, in some embodiments, also be applicable to the like-named components shown in FIG. **4**.

Storage device **404** stores one or more programs for controlling processor **400**. The programs comprise program instructions (which may be referred to as computer readable program code means) that contain processor-executable process steps of the biometric system **204**, executed by the processor **400** to cause the biometric system **204** to function as described herein.

The programs may include one or more conventional operating systems (not shown) that control the processor **400** so as to manage and coordinate activities and sharing of resources in the biometric system **204**, and to serve as a host for application programs (described below) that run on the biometric system **204**.

The programs stored in the storage device **404** may include a software interface **410** that controls the processor **400** to support interactions between the biometric system **204** and the authentication system **202**.

Further, the storage device **404** may store an authentication request handling program **412** that handles requests that the biometric system **204** conduct a biometric user authentication process with respect to particular online purchase transactions.

The storage device **404** may also store, and the biometric system **204** may also execute, other programs, which are not shown. For example, such programs may include a reporting application, which may respond to requests from system administrators for reports on the activities performed by the biometric system **204**. The other programs may also include, e.g., device drivers, database management programs, communication software, etc.

The storage device **404** may also store a database **414** of biometric reference data. The biometric reference data may have been stored in connection with enrollment and/or registration of users, and may be employed to verify biometric data collected from users in connection with online purchase transactions.

FIG. **5** is a block diagram of an embodiment of the history server computer **206**.

In its hardware architecture and components, the history server computer **206** may, for example, resemble the hardware architecture and components described above in connection with FIG. **3**. However, the history server computer **206** may be programmed differently from the authentication system **202** and the biometric system **204** so as to provide different functionality.

Returning again to the hardware aspects of the history server computer **206**, it may include a processor **500**, a communication device **501**, a storage device **504**, an input device **506** and an output device **508**. The communication device **501**, the storage device **504**, the input device **506** and the output device **508** may all be in communication with the processor **500**.

The above descriptions of the hardware components shown in FIG. **3** may, in some embodiments, also be applicable to the like-named components shown in FIG. **5**.

Storage device **504** stores one or more programs for controlling processor **500**. The programs comprise program instructions (which may be referred to as computer readable program code means) that contain processor-executable process steps of the history server computer **206**, executed by the processor **500** to cause the history server computer **206** to function as described herein.

The programs may include one or more conventional operating systems (not shown) that control the processor **500** so as to manage and coordinate activities and sharing of resources in the history server computer **206**, and to serve as a host for application programs (described below) that run on the history server computer **206**.

The programs stored in the storage device **504** may include a software interface **510** that controls the processor **500** to support interactions between the history server computer **206** and the authentication system **202**.

Further, the storage device **504** may store query handling program **512** that handles requests from the authentication system **202** for access to transaction history data maintained in the history server computer **206**.

The storage device **504** may also store, and the history server computer **206** may also execute, other programs, which are not shown. For example, such programs may include a reporting application, which may respond to requests from system administrators for reports on the activities performed by the history server computer **206**. The other programs may also include, e.g., device drivers, database management programs, communication software, etc.

The storage device **504** may also store a database **514** of transaction history data. The transaction history data may be transmitted to the history server computer **206** for storage in the database **514** contemporaneously with the handling of authentication requests for the transactions by the authentication system **202**. The transaction history data may also be accessible via queries submitted by the authentication system **202**.

Other computer components of the payment system **200** (FIG. **2**) may also have the same type of hardware architecture and/or components as described above in connection with FIG. **3**, and may be suitably programmed for the respective roles of those computer components.

FIGS. **6**A and **6**B together form a flow chart that illustrates aspects of the present disclosure. In particular, the flow chart of FIGS. **6**A/**6**B illustrates a process that may be performed in the payment system **200** in some embodiments.

As indicated by block **602** in FIG. **6**A, the process may begin with a user's initiation of an online purchase transaction, of a kind previously described herein. For present purposes, it is assumed that the online purchase transaction is via the e-commerce server **102-1** depicted in FIG. **2**.

As indicated at block **604**, it is assumed that the user selected a digital wallet function for checkout in connection with the transaction. At block **606**, it is indicated that the user has selected a particular payment account from his or her digital wallet for use in the current transaction. Next, as indicated at block **608**, the authentication system **202** is called to handle a user authentication process to aid in securing the current transaction against fraud. (The call to the authentication system **202**—like a similar step described below for a subsequent transaction—may include an indication that the transaction is wallet-based and may provide a wallet identifier.) It may be assumed, for example, that one or more rules set by the account issuer and/or the parameters of the transaction (e.g., one or more of: merchant identity and/or category, monetary amount of the transaction, nature of the merchandise being purchased, current time of day/day of week, geographic location of merchant, etc.) may call for user authentication to be performed for the transaction. It is further assumed that the issuer rules and/or transaction parameters call for biometric user authentication to be employed, and that user authentication of this type had previously been set up with this user (see block **610**, FIG. **6**A).

At block **612** in FIG. **6**A, the authentication system **202** places a function call to the biometric system **204** to request that the biometric system **204** conduct a biometric-based user authentication process with respect to the current transaction. For example, a fingerprint/thumbprint scan and verification of the resulting input biometric data may take place.

A decision block **614** may follow block **612** in the process of FIGS. **6**A/**6**B. At decision block **614**, it may be determined whether the biometric-based user authentication process was completed successfully (i.e., the submitted biometric data was verified). If so, then, in parallel, two process blocks, namely blocks **616** and **618**, may follow decision block **614**.

At block **616**, the authentication system **202** may log a suitable record in the history server computer **206**. For example, the record may indicate that biometric-based user authentication was successfully performed at the current date and time. The record may also identify the payment account (e.g., by PAN) with respect to which the user authentication occurred. In some embodiments, the record may additionally or alternatively identify the user and/or the user digital wallet for the current transaction. In some embodiments, the record may also or alternatively record the geographic region or location of the user's device, as determined by the device Internet Protocol address (so-called "geo i.p."), for use in current or subsequent risk management processes.

At block **618**, the authentication system **202** may supply the result of the user authentication process (assumed in this case to be successful biometric-based authentication) to the merchant e-commerce server.

In some embodiments, the record of the user authentication and/or the report to the merchant may include an indication of the type of biometric measurement employed (e.g., fingerprint scan vs. facial scan vs. voice recognition, etc.).

Block **620** may follow block **618** in the process of FIGS. **6**A/**6**B. At block **620**, and in response to the indication that user authentication is successful, the merchant may complete the transaction. This may include the merchant sending an authorization request via its transaction acquirer to the account issuer, receiving back an authorization response, indicating to the user that the transaction is complete, and initiating a process for shipment of the selected merchandise. In some embodiments, the authorization request may include an indication that user authentication was successfully performed. The latter indication may be considered by the account issuer as part of its risk management processing related to handling of the authorization request.

In some embodiments, apart from the processing at block **616**, the process through blocks **602** to **620** may be performed in accordance with conventional practices.

It is next assumed that the user goes on to engage in another e-commerce transaction—e.g., with a different merchant—at a point in time not very much later than the conclusion of the first transaction as indicated at **620**. Thus, the start of the later transaction is indicated by block **622** in FIG. **6**B. It is further assumed that—as indicated at block **624**—the user has again selected a digital wallet function in connection with the checkout phase for the later transaction. In some situations, the same digital wallet may be selected as in the first transaction; in some situations—assuming the user has more than one digital wallet—the user may have selected a different digital wallet from the digital wallet used in the first transaction.

Block **626** may follow block **624**. At block **626**, the user may select a particular payment account for the current (i.e., the later) transaction from the digital wallet selected in block **624**. In some situations, the same payment account may be selected as in the first transaction; in some situations a different payment account may be selected. In some situations, if the payment account selected at **626** is different from the payment account used for the first transaction, the former payment account may be held in the same digital wallet with the latter payment account. In some situations, the former payment account may be held in a different digital wallet from the former payment account and/or in a different digital wallet from the digital wallet accessed in connection with the first transaction.

Block **628** may follow block **626**. At block **628**, the authentication system **202** is called to engage in a user authentication process in connection with the second transaction. However, in accordance with aspects of the present disclosure, the authentication system **202** may determine, in at least some cases, that the user should be considered authenticated—without actually engaging in a user authentication process—in view of a recent successful user authentication. As will be seen, this determination may be made on the basis of rules. Examples of such rules will be described below.

In the process of FIGS. **6**A/**6**B, a decision block **630** may follow block **628**. At decision block **630**, the authentication system **202** may determine whether a relevant previous user authentication is recorded in the history server computer **206**. A recorded previous user authentication may be deemed "relevant" if one or more rules indicate that the occurrence of the previous user authentication is to be considered by the authentication system **202** in determining whether or not to omit engaging in a user authentication process for the current (i.e., the later) transaction. The relevance or not of a previous user authentication may depend on factors such as (a) whether or not the payment account selected for the current transaction is the same as the payment account selected for the previous transaction; (b) whether or not the payment account selected for the current transaction is held in the same digital wallet as the payment account selected for the previous transaction; (c) whether or not the payment account selected for the current transaction is held in a digital wallet that includes a payment account that is also held in the digital wallet that was used in the previous transaction; (d) the time elapsed between the previous transaction and the current transaction; and/or (e) other attributes of the current transaction, including for example the monetary amount to be paid in the current transaction, the nature of the goods or services to be purchased, the identity or category of the merchant, the time of day in the merchant's time zone, etc.

If a positive determination is made at decision block **630** (i.e., if the authentication system **202** determines that a relevant user authentication is recorded in the history server computer **206**), then block **632** may follow decision block **630**. At block **632**, the authentication system **202** may perform a likelihood-of-fraud scoring process with respect to the current transaction. This latter process may resemble known risk management algorithms. For example, factors such as the transaction amount, the identity or category of the merchant, the user's typical spending patterns, the geographic location of the merchant, the type of goods or services being purchased and/or other factors may be considered to determine whether the current transaction presents a high or low risk that it is fraudulent. An outcome of the fraud scoring process may be a numerical fraud score (e.g. on a 1 to 5 scale of integer scores). The determination of the fraud score may consider, among other factors, whether the geo i.p. of the user device matches what would be expected for the transaction.

In the process of FIGS. **6**A/**6**B, a decision block **634** (FIG. **6**B) may follow block **632**. At decision block **634**, the authentication system **202** may determine whether a fraud score produced at **632** is at a level (e.g., relative to a pre-determined threshold) so as to indicate that the risk of fraud is low or acceptable (i.e., the risk is not too high). If a positive determination is made at decision block **634** (i.e., if the fraud score is at least acceptable), then block **636** may follow decision block **634**. At block **636**, the authentication system **202** may omit any user authentication process that might otherwise be prescribed for the current transaction (e.g., a biometric user authentication, submission and verification of a PIN, etc.), and at the same time the authentication system **202** may indicate to the merchant for the current transaction (i.e., the later transaction) that the user is deemed to have been authenticated. For example, in some embodiments, the authentication system **202** may provide the same indication to the merchant as if a biometric user authentication had just been successfully completed with respect to the current transaction. Alternatively, in some embodiments, the indication from the authentication system **202** to the merchant may indicate that the authentication system **202** deems the user to have been authenticated without having performed a user authentication process for the current transaction.

Block **638** may follow block **636**. At block **638**, the merchant may complete the current transaction. This process stage may resemble the process stage described above with respect to block **620** (FIG. **6**A). Of course, the actual data included in the authorization request in connection with block **638** will reflect the details of the later transaction rather than the earlier transaction. In some embodiments, if the authorization request for the later transaction includes an indication as to user authentication, such an indication may or may not indicate that the user authentication was "deemed" rather than "actual". With respect to either sort of indication, the same may be taken into account by the account issuer in performing a risk management process with respect to the authorization request.

Referring again to decision block **630** (FIG. **6**B), if a negative determination is made at that point (i.e., if there is no relevant recorded prior user authentication), then block **640** may follow decision block **630**. The process stage represented at **640** may include processes that resemble the process stages described previously with respect to blocks **610** and **612** (FIG. **6**A), and thus may include performance of a biometric user authentication process or other user authentication process. Moreover, block **640** should also be understood to include process stages like those described above in connection with blocks **614**, **616**, **618** and **620** (i.e., successful user authentication, sending authentication result to merchant, completion of transaction, logging of transaction to history server computer **206**).

Referring again to decision block **634** (FIG. **6**B), if a negative determination is made at that point (i.e., if the fraud score obtained at **632** is not "OK"), then block **640**, as just referred to above, may follow decision block **634**.

Rules that may apply in connection with decision blocks **630** and/or **634** will now be further discussed. It is noted that, to a considerable extent, examples of rules of this kind have already been suggested by prior discussion, including the discussion of what is or may be considered a relevant recorded prior user authentication. In some embodiments, each account issuer may be permitted to register with the authentication system **202** and may be allowed to prescribe one or more rules to guide or control the determination of the authentication system **202** as to whether user authentication can be omitted for a given transaction. In some embodiments, the issuers may be permitted to prescribe different rules or sets of rules for different classes of payment accounts issued by the particular issuer.

In one example type of rule, user authentication may be skipped—for a certain class of payment accounts—for a low monetary amount/low risk transaction if there was a successful relevant biometric user authentication within the past 12 hours; for a high monetary amount/high risk transaction the user authentication may be skipped only if there was a successful relevant biometric user authentication within the past two hours. For the purposes of the example rules in the previous sentence, "relevance" implies that the payment account used in the previous transaction (i.e., the transaction for which biometric user authentication was successfully performed) was held in the same wallet with the account used for the current transaction and/or was held in a wallet that had an account in common with the wallet used in the previous transaction.

With a payment system such as the payment system **200**, and particularly with a process as illustrated in FIGS. **6**A/**6**B, convenience for the user may be enhanced by at least sometimes omitting user authentication processes for certain transactions, while also satisfying prudent approaches to transaction security. The omission of user authentication in some cases may promote completion of online purchase transactions, and may reduce the possibility that such transactions will be abandoned by users who do not wish to undergo user authentication for a given transaction.

It should be noted that the sequence of process stages may vary from the sequence explicitly illustrated in FIGS. **6**A/**6**B. To provide just one example, fraud scoring could occur prior to a determination as to whether there is a relevant recent user authentication recorded for the same user.

The above description of certain embodiments has generally referred to use of biometric user authentication, but in alternative embodiments the principles of this disclosure may also or alternatively be applied to other types of user authentication, including user entry of PINS or passwords, authentication by presentation of physical authentication tokens, etc. In some embodiments, for example, a rule may provide that if there is a relevant recent biometric user authentication record for payment account A, then, in a subsequent transaction using payment account B (for which PIN user authentication would otherwise be required; and held in the same digital wallet), the user authentication may be omitted.

In embodiments discussed above, digital wallets were referred to as being held in computers operated by one or more wallet service providers (WSPs). However, in other embodiments, digital wallets may be hosted by one or more of WSPs, merchants and/or account issuers. In some embodiments, user authentication that occurs with reference to an account in a wallet held in one of these types of entities may cause user authentication to be omitted in a subsequent transaction using an account in a wallet held in a different one of these types of entities.

As used herein and in the appended claims, the term "computer" should be understood to encompass a single computer or two or more computers in communication with each other.

As used herein and in the appended claims, the term "processor" should be understood to encompass a single processor or two or more processors in communication with each other.

As used herein and in the appended claims, the term "memory" should be understood to encompass a single memory or storage device or two or more memories or storage devices.

As used herein and in the appended claims, a "server" includes a computer device or system that responds to numerous requests for service from other devices.

The flow charts and descriptions thereof herein should not be understood to prescribe a fixed order of performing the method steps described therein. Rather the method steps may be performed in any order that is practicable, including simultaneous performance of steps.

As used herein and in the appended claims, the term "payment card system account" includes a credit card account, a deposit account that the account holder may access using a debit card, a prepaid card account, or any other type of account from which payment transactions may be consummated. The terms "payment card system account" and "payment card account" and "payment account" are used interchangeably herein. The term "payment card account number" includes a number that identifies a payment card system account or a number carried by a payment card, or a number that is used to route a transaction in a payment system that handles debit card and/or credit card transactions. The term "payment card" includes a credit card, debit card, prepaid card, or other type of payment instrument, whether an actual physical card or virtual.

As used herein and in the appended claims, the term "payment card system" refers to a system for handling purchase transactions and related transactions. An example of such a system is the one operated by MasterCard International Incorporated, the assignee of the present disclosure. In some embodiments, the term "payment card system" may be limited to systems in which member financial institutions issue payment card accounts to individuals, businesses and/or other organizations.

Although the present disclosure has been described in connection with specific exemplary embodiments, it should be understood that various changes, substitutions, and alterations apparent to those skilled in the art can be made to the disclosed embodiments without departing from the spirit and scope of the disclosure as set forth in the appended claims.

What is claimed is:

1. A method comprising:

performing a first transaction using a first payment account, the first transaction including a successful authentication of a holder of the first payment account, the first transaction performed using a first digital wallet;

storing a record of the first transaction, the stored record including an indication that the successful authentication occurred;

receiving a request for a second transaction using a second payment account held by the holder of the first payment account, the second transaction different from the first transaction, the second transaction performed using a second digital wallet different from the first digital wallet;

detecting the indication of the successful authentication in the stored record of the first transaction;

applying a rule to the second transaction, the rule directing that the indication of the successful authentication is relevant to the second transaction in cases where a third payment account is held in both the first digital wallet and the second digital wallet;

determining that the rule is satisfied with respect to the second transaction; and

in response to the determining step, completing the second transaction without requiring authentication of the account holder.

2. The method of claim **1**, wherein the successful authentication is a biometric authentication.

3. The method of claim **2**, wherein the detected indication indicates that the successful authentication was a biometric authentication.

4. The method of claim **1**, wherein the successful authentication is not a biometric authentication.

5. A method comprising:

performing a first transaction using a first payment account, the first transaction including a successful authentication of a holder of the first payment account, the first transaction performed using a first digital wallet;

storing a record of the first transaction, the stored record including an indication that the successful authentication occurred; the stored record including an indication of a first point in time, the first point in time being a point in time when the successful authentication occurred;

receiving a request for a second transaction using a second payment account held by the holder of the first payment account, the second transaction different from the first transaction; the request for the second transaction being received at a second point in time later than the first point in time, the second transaction performed using a second digital wallet different from the first digital wallet;

detecting the indication of the successful authentication in the stored record of the first transaction;

comparing a time interval between the first and second points in time with a predetermined permissive time interval;

applying a rule to the second transaction, the rule directing that the indication of the successful authentication

is relevant to the second transaction in cases where a third payment account is held in both the first digital wallet and the second digital wallet;

determining that the rule is satisfied with respect to the second transaction;

in response to the determining step, completing the second transaction without requiring authentication of the account holder in a case where the time interval between the first and second points in time does not exceed the predetermined permissive time interval; and

requiring authentication of the account holder in connection with the second transaction in a case where the time interval between the first and second points in time exceeds the predetermined permissive time interval.

6. The method of claim **5**, wherein the predetermined permissive time interval is defined by an issuer of the second payment account.

7. An apparatus comprising:

a processor;

a memory in communication with the processor, the memory storing program instructions, the processor operative with the program instructions to perform functions as follows:

performing a first transaction using a first payment account, the first transaction including a successful authentication of a holder of the first payment account, the first transaction performed using a first digital wallet;

storing a record of the first transaction, the stored record including an indication that the successful authentication occurred;

receiving a request for a second transaction using a second payment account held by the holder of the first payment account, the second transaction different from the first transaction, the second transaction performed using a second digital wallet different from the first digital wallet;

detecting the indication of the successful authentication in the stored record of the first transaction;

applying a rule to the second transaction, the rule directing that the indication of the successful authentication is relevant to the second transaction in cases where a third payment account is held in both the first digital wallet and the second digital wallet;

determining that the rule is satisfied with respect to the second transaction; and

in response to the determining step, completing the second transaction without requiring authentication of the account holder.

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